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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude & Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

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TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

RESISTOR

~~MULTIPLE-COIL~~ WINDER (elec. equip.) ~~6-98.250~~

5.227

~~B-50I~~

~~(Supersedes B-182)~~

U. S. Employment Service
in Cooperation with
Nebraska State Employment Service

March 1963

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TM 001 239

GATB # 2388

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

Multiple-Coil Winder (elec. equip.) 6-98.250

B-504

(Supersedes B-182)

Summary

The General Aptitude Test Battery, B-1002A, was administered to a final sample of 50 women employed as Multiple-Coil Winder 6-98.250. The total sample was employed at Dale Electronics, Columbus, Nebraska. The criterion consisted of supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data and their combined selective efficiency, Aptitudes G - Intelligence, K - Motor Coordination, and F - Finger Dexterity were selected for inclusion in the final test norms.

GATB Norms for Multiple-Coil Winder, 6-98.250, B-504.

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
G	CB-1- H CB-1- I CB-1- J	90	G	Part 3 Part 4 Part 6	85
T	CB-1- G CB-1- K	100	K	Part 8	100
F	CB-1- O CB-1- P	115	F	Part 11 Part 12	110

Effectiveness of Norms

The data in Table IV indicate that 9 of the 16 poor workers, or 56 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 56 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 28 of the 35 workers who made qualifying test scores, or 80 percent, were good workers.

TECHNICAL REPORT

I. Purpose

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Multiple-Coil Winder, 6-98.250.

II. Sample

The GATB, B-1002A, was administered during the period August 8-11, 1961 to a total sample of 50 women employed as Multiple-Coil Winder 6-98.250, at Dale Electronics, Columbus, Nebraska. There were no minimum age, education or experience requirements for employment. Two weeks is usually required for a worker to reach average production. All workers in this sample had at least one month of experience. Applicants are tested with USES aptitude test battery B-182 and referred for employment; in a tight labor market results on this test are not strictly adhered to. In most cases the selection of applicants for employment was made on the basis of scores made on the B-182 and a personal interview.

TABLE I

Means (M), Standard Deviations (σ), Ranges, and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

N = 50	M	σ	Range	r
Age (years)	28.2	9.8	18-51	-.052
Education (years)	11.7	1.2	8-14	-.083
Experience (months)	13.4	18.7	1-71	.216

III. Job Description

Job Title: Multiple-Coil Winder (elec. equip.) 6-98.250.
(Supersedes B-182)

Job Summary: Sets up and operates coil winding machine to wind proper amount of wire around resistor sub-assembly to arrive at a specified resistance value. Uses electrodes to weld wire and checks resistance value of coil by use of a wheatstone bridge tester.

Work Performed. Sets up machine: Receives capped ceramic sub-assembly, wire, and order specifications from material handler. Sets up wheatstone bridge tester by dialing in resistance value of outlined on order specifications.

Prepares for winding: Picks up ceramic blank from tote with left hand, opens tailstock on winding machine with right hand. Positions ceramic blank sub-assembly into adaptors in tailstock. Closes tailstock, positions wire guide, and positions wire into wire guide. Positions wire on right end cap of ceramic sub-assembly for welding.

Welds starting end of wire on cap: Holds electrode in right hand, places it in three positions. Activates electrode with right knee by pressing to the side a lever beneath machine. Burns off excess wire with electrode, brushes aside burnt wire with left hand.

Winds wire on ceramic: Removes back lash from wire with right hand. Turns fly wheel with left hand, depresses foot pedal to start machine and winds wire around ceramic. Cuts power in machine by releasing foot pedal, but machine continues winding. Stops machine by pressure of left hand on flywheel just before coil is completely wound. Advances flywheel further with left hand to complete winding to value as per wheatstone bridge reading as specified by order specification. Checks to be certain proper resistance has been wound.

Welds finishing end of wire on cap: Moves wire guide aside with left hand. Positions wire on left end of cap with left hand. Grasps electrode with right hand, positioning it on wire to weld. Activates electrode with right knee. Welds wire in three positions on cap. Cuts wire from cap with electrode. Releases wire from left hand which has come from wire spool to ceramic. Burns off excess wire on coil.

Puts completed piece on tote: Opens tailstock with right hand by releasing tailstock lever. Removes wound piece, places it in tray on tote.

May unwind: May unwind coil because of burn-offs, wire breaks, binds, or test failures. Rewinds coil if necessary.

Replaces tote: Pulls full tote aside, positions empty one after each 100 coils are wound.

Inspection interruptions: Interrupts work five times per day for wheatstone bridge check. Interrupts work each hour for wire tension check on wire .0031" or finer.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

Rank-order supervisory ratings were made by the Plant General Foreman on August 25, 1961. The rank order ratings were converted to linear scores which ranged from 6 to 94 with a mean score of 50 and a standard deviation of 18.7 and were correlated with broad category ratings made by several first-line foremen. A correlation of .36 was obtained, which is significant at the 5 percent level but not high enough to warrant combining the criteria. Perhaps the relatively low correlation of .36 can be accounted for by the fact that the Plant General Foreman appeared to be in a better position to rate the workers. Also, several of the first line foremen, even after thorough explanation, did not seem to understand which factors were to be rated and talked in terms of personalities as they made the job performance ratings. The criterion was dichotomized by the Plant General Foreman at a point which he designated as the point of demarcation between satisfactory and unsatisfactory workers.

VI. Qualitative and Quantitative Analyses

A. Qualitative Analysis:

The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Intelligence (G) - required to properly set up, interpret and use equipment.

Spatial Aptitude (S) - required to position and wind wire.

Motor Coordination (K) - required to have close control over the equipment by hand-positioning, and starting and stopping the operation.

Finger Dexterity (F) - required to properly use very small parts and wires.

Manual Dexterity (M) - required to have efficient and accurate dexterity in handling material and equipment.

B. Quantitative Analysis:

TABLE II

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB; N = 50

Aptitudes	M	σ	r
G-Intelligence	105.3	14.5	.313*
V-Verbal Aptitude	102.9	13.0	.182
N-Numerical Aptitude	103.5	16.8	.110
S-Spatial Aptitude	107.0	19.0	.379*
P-Form Perception	119.5	14.4	.118
Q-Clerical Perception	117.3	16.0	-.049
K-Motor Coordination	113.2	12.5	.082
F-Finger Dexterity	121.5	16.9	.347*
M-Manual Dexterity	102.0	19.4	.187

*Significant at the .05 level.

C. Selection of Test Norms:

TABLE III

Summary of Qualitative and Quantitative Data

Type of Evidence	Aptitudes								
	G	V	N	S	P	Q	K	F	M
Job Analysis Data									
Important	x			x			x	x	x
Irrelevant									
Relatively High Mean					x	x		x	
Relatively Low Sigma	x	x			x		x		
Significant Correlation with Criterion	x			x				x	
Aptitudes to be Considered for Trial Norms	G			S	P		K	F	

Trial norms consisting of various combinations of Aptitudes G,S,P,K and F with appropriate cutting scores were evaluated against the criterion by means of the Phi Coefficient technique. A comparison of the results showed that B-1002 norms consisting of G-85, K-100 and F-110 had the best selective efficiency.

VII. Validity of Norms

The validity of the norms was determined by computing a Phi Coefficient between the test norms and the criterion and applying the Chi Square test. The criterion was dichotomized by placing 32 percent of the sample in the low criterion group because this percent was considered to be the unsatisfactory or marginal workers.

Table IV shows the relationship between test norms consisting of Aptitudes G, K and F with critical scores of 85, 100 and 110, respectively, and the dichotomized criterion for Multiple-Coil Winder 6-98.250. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Validity of Test Norms for Multiple-Coil Winder 6-98.250
(G-85, K-100, F-110)

N = 50	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	6	28	34
Poor Workers	9	7	16
Total	15	35	50

Phi Coefficient = .39
χ^2 = 7.720
P/2 < .005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of the results of this study, Aptitudes G, K and F with minimum scores of 85, 100 and 110, respectively, have been established as B-1002 norms for Multiple-Coil Winder 6-98.250. The equivalent B-1001 norms consist of G-90, T-100 and F-115.

IX. Determination of Occupational Aptitude Pattern

The specific norms established for this study did not meet the requirements for incorporation into any of the existing 35 OAP's (revised 10/61). The data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.